

3. EMISSIONS INVENTORY

This section provides a description of the emissions inventory for the existing facility with proposed modifications and applicable background emission sources. In addition, a BACT analysis is included for new and modified sources. The applicable NSPSs for this facility are Subpart 000 - Standards of Performance for Nonmetallic Mineral Processing Plants from 40 CFR 60.670 and Subpart Dc - Standards of Performance for Industrial Boilers from 40 CFR 60.40. As presented in the BACT analysis, all new particulate emission sources within the soda ash production facility will meet or exceed the NSPS emission limitation of 0.05 grams/dry standard cubic meter (0.02 grains/dry standard cubic foot). Subpart Dc addresses steam generating units with a maximum heat input capacity of 100 MM Btu/hr, however, emission standards for natural gas fired units are not specified.

3.1 EXISTING FACILITY WITH PROPOSED MODIFICATIONS

The proposed modifications to the existing soda ash facility will result in an increase in PM₁₀ emissions of 106 TPY, CO emissions of 6,576 TPY, VOC emissions of 3,298 TPY, and SO₂ emissions of less than 1 TPY. NO_x emission will increase by 260.4 TPY, but these are offset by an "actual" NO_x emissions reduction of 596 TPY as noted in Table 2-2: MD-229 PSD Emissions. The PSD net emissions changes (including emissions from MD-229 and MD-282 which have not been addressed by a PSD permit analysis) are tabulated below and compared to PSD significant rates. As noted, PM₁₀, CO, and VOC emission rates trigger PSD permit review:

Table 3-1: PSD Net Emissions Changes

(Tons Per Year)

	PM ₁₀	CO	VOC	SO ₂	NO _x
(PSD Incremental Emissions Covered by a Current Permit)					
MD-229					-596.9
MD-282	6.0	0.0	0.0	3.4	+16.2
Expansion	106.0	6575.6	3299.3	0.3	268.5
Total	112.0	6575.6	3299.3	3.7	-312.2
Significant Level	15	40	100	40	40
Exceed Significant Level?	Yes	Yes	Yes	No	No

3.1.1 Air Toxics Emissions

Numerous tests have been conducted at the SSAJV facility to quantify VOC emissions (non-methane/ethane hydrocarbons) and to speciate and quantify hazardous air pollutants (HAPs). Only recently, VOC and HAP emissions have been identified as being emitted from the trona ore, especially during calcination of the ore. The stack testing methods to speciate and quantify HAPs have evolved in these few years of testing. Following is a brief discussion of the testing methods used.

3.1.1.1 HAP Testing Review

3.1.1.1.1 Methods SW-846 0010 and 0030

During 1994 and early 1995, EPA Methods 0010 and 0030 were conducted on SSAJV's existing calciner stacks (AQD #s17 and 48). These methods involve capturing the stack gas in various cartridges, transporting them to a laboratory, and then extracting the captured compounds onto a gas chromatograph (GC). Results of the 0010 for semi-volatiles revealed nearly insignificant emission rates, with the highest concentration in the range of only hundredths of a ppm. The 0030 testing for volatiles resulted in higher concentrations, so future testing has focused on these volatile organic emissions.

3.1.1.1.2 EPA Method 18

To more accurately quantify the HAP emissions, it was decided to do additional testing utilizing EPA Method 18, focusing on the volatiles identified in the 0030 testing. During 1995, stack samples were collected in Tedlar[®] bags, and then transported to a laboratory for analysis on a GC. Problems arose, with some tedlar bags leaking during transit to the laboratory, as well as degradation of some of the compounds.

3.1.1.1.3 On-site Method 18

To alleviate the Tedlar[®] bag leakage problem, the next level of testing was done utilizing EPA Method 18 with a GC on-site. Stack gases were injected directly into the GC from a heated sample line. This method of testing for HAPs was first conducted during December, 1995.

Some of the tests utilizing Method 18 identified chlorinated compounds, including methylene chloride, 1,1,1-trichloroethane, and trichloroethene, as well as acrylonitrile. These compounds were not found in every test run. Since the presence of chlorinated compounds was suspicious, during the July 1996 testing, two GCs were utilized; one with a column specifically designed to detect methylene chloride. This was done to more accurately differentiate the compounds. During this round of testing, methylene chloride was not detected.

3.1.1.1.4 Boiler and Industrial Furnace (BIF) EPA Method 0011

To further analyze for HAPs which are not detected by the GC, the Boiler and Industrial Furnace (BIF) EPA Method 0011 was utilized during December 1995 and July 1996. This test method identifies aldehydes and ketones.

3.1.1.1.5 On-site GC/MS - Direct Interface

The most recent HAP testing conducted at the SSAJV facility, during November 1996, utilized a Gas Chromatograph/Mass Spectrometer (GC/MS). The stack gases were directly injected into the GC/MS from a heated sample line. The GC/MS not only allows separation of compounds by the retention time associated with the GC, but also separates compounds by their mass spectra. This twofold separation allows a very specific, accurate identification of compounds. The GC/MS did not identify any chlorinated compounds or acrylonitrile in the calciner stack gases, which had previously been identified by the GC. SSAJV believes the identification of these compounds by the GC may have been a testing inaccuracy or laboratory artifact. As noted above, testing during July 1996 utilized two on-site GCs, one with a column specific to methylene chloride. Methylene chloride was not detected. Even so, the emission rates of the chlorinated compounds obtained by the GC testing during December 1995, have been analyzed for ambient impacts. Estimated HAP emissions from the calciners are included in Tables 3-2, 3-3, and 3-4.

Table 3-2 summarizes EPA Method SW846 0010 - Semi-Volatile HAPs. This test was conducted in August 1994. The results are reported as pounds per ton of ore. This emission factor is then multiplied by the maximum ore tonnage rate (TPH) to determine the PPH emission rate of each of the three calciner sources (AQD #s 17, 48 and 80).

Table 3-2: EPA Method 0010 Semi-Volatile Organic HAPs

Compounds	AQD #48	AQD #17	AQD #48	AQD #80
Units	PPT	PPH	PPH	PPH
Comments	Aug '94 Test	@ 400 TPH	@200 TPH	@275 TPH
Acetophenone	0.0000399	0.0160	0.0080	0.0110
Biphenyl	0.0000570	0.0228	0.0114	0.0157
bis(2-Ethylhexyl)phthalate	0.00000385	0.0015	0.0008	0.0011
2-Chloroacetophenone	0.00000349	0.0014	0.0007	0.0010
3/4 Methylphenol	0.0000233	0.0093	0.0047	0.0064
Cumene	0.00000443	0.0018	0.0009	0.0012
Dibenzofuran	0.0000477	0.0191	0.0095	0.0131
Di-n-butylphthalate	0.0000288	0.0115	0.0058	0.0079
N,N-Dimethylaniline	0.0000191	0.0076	0.0038	0.0052
Naphthalene	0.000369	0.1477	0.0739	0.1016
Phenol	0.000227	0.0907	0.0453	0.0623

Table 3-3 summarizes EPA Method 0011 - Aldehydes and Ketones. A statistical analysis of the stack test results was conducted to derive both the expected average and maximum hourly emissions. First, the average of the tests for each calciner is calculated, when this is multiplied by the maximum hourly tonnage rate, the result is "average" PPH. When 3 times the standard deviation of the test results is added to the average of the tests, the result is the "maximum" expected hourly emission rate. This result has a confidence level of 99.7 percent. This too, is multiplied by the maximum hourly tonnage rate to determine maximum PPH. The table notes the test results conducted during December 1995 and July 1996 on both calciner stacks (AQD #s 17

and 48). The average of the tests on both sources is applied to the new calciner source (AQD #80) for expected emission rates. The PPH rate is determined as explained above.

Table 3-3: EPA Method 0011 Aldehydes and Ketones

Test Results - Pounds per Ton of Ore						
Source	AQD #17	AQD #48	Both	AQD #17	AQD #48	Both
Comments	Average Tests	Average Tests	Average Tests	Ave & 3(Std Dev)	Ave & 3(Std Dev)	Ave & 3(Std Dev)
Compounds	PPT	PPT	PPT	PPT	PPT	PPT
Formaldehyde	0.00075	0.0002	0.000475	0.000962	0.000624	0.001466
Acetaldehyde	0.00065	0.00055	0.0006	0.002983	0.001186	0.002007
Propionaldehyde	0.0002	0.00015	0.000175	0.001049	0.000362	0.000687
Acrolein	0.0018	0.00135	0.001575	0.004346	0.001562	0.003243
Acetone	0.0006	0.0003	0.00045	0.003146	0.001573	0.002173
2-Butanone	0.0003	0.00015	0.000225	0.001573	0.000786	0.001087
Expected Emissions - Pounds per Hour						
Source	AQD #17	AQD #48	AQD #80	AQD #17	AQD #48	AQD #80
Production Rate	400 TPH	200 TPH	275 TPH	400 TPH	200 TPH	275 TPH
	Average	Average	Average	Maximum	Maximum	Maximum
Compounds	PPH	PPH	PPH	PPH	PPH	PPH
Formaldehyde	0.30	0.04	0.13	0.38	0.12	0.26
Acetaldehyde	0.26	0.11	0.17	1.19	0.24	0.82
Propionaldehyde	0.08	0.03	0.05	0.42	0.07	0.29
Acrolein	0.72	0.27	0.43	1.74	0.31	1.20
Acetone	0.24	0.06	0.12	1.26	0.31	0.87
2-Butanone	2-Butanone results from Method 18 used for modeling					

Average emission rate calculation: Average PPT X Maximum Production Rate TPH = Average PPH

Maximum emission rate calculation: (Average + 3(Std Dev) PPT) X Maximum Production Rate TPH = Maximum PPH.

For proposed AQD #80, used average of AQD #s 17 and 48 test results.

Table 3-4 summarizes the average of EPA Method 18. The tests conducted during December 1995 and July 1996 utilized the GC, and the November 1996 test utilized the GC/MS. Table 3-4 notes average and maximum expected emission rates, calculated as explained above. 1,1,1-trichloroethane, acrylonitrile, methylene chloride, and

trichloroethene were not identified during the GC/MS testing. It is believed that these compounds were misidentified on the GC.

Table 3-4: EPA Method 18 HAPs

Test Results - Pounds per Ton of Ore						
Source	AQD #17	AQD #48	Both	AQD #17	AQD #48	Both
	Average of Tests	Average of Tests	Average of Both	Ave & 3(Std Dev)	Ave & 3(Std Dev)	Ave & 3(Std Dev)
Compounds	PPT	PPT	PPT	PPT	PPT	PPT
Benzene	0.02785	0.033233	0.030542	0.062659	0.053045	0.059023
1,3 Butadiene	0.018875	0.0253	0.022088	0.129729	0.15469	0.130858
Ethyl Benzene	0.00425	0.0024	0.003325	0.015374	0.008664	0.012477
2-Butanone	0.00945	0.0037	0.006575	0.049054	0.013314	0.036576
Hexane	0.0089	0.010167	0.009533	0.036768	0.034506	0.033822
Styrene	0.00515	0.005967	0.005558	0.014907	0.020889	0.016673
Toluene	0.013975	0.0123	0.013138	0.033219	0.017015	0.027272
Xylene	0.01915	0.0159	0.017525	0.05651	0.038883	0.047543
*1,1,1-Trichloroethane	0.00545	0.0142	0.009825	0.028572	0.02014	0.030311
*Acrylonitrile	0.0026	0.00145	0.002025	0.013631	0.007602	0.009584
*Methylene Chloride	0.0006	0.0018	0.0012	0.003146	0.009437	0.006291
*Trichloroethene	0.01955	0.0058	0.012675	0.095705	0.018952	0.063252
Expected Emissions - Pounds per Hour						
Source	AQD #17	AQD #48	AQD #80	AQD #17	AQD #48	AQD #80
Production Rate	400 TPH	200 TPH	275 TPH	400 TPH	200 TPH	275 TPH
	Average	Average	Average	Maximum	Maximum	Maximum
Compounds	PPH	PPH	PPH	PPH	PPH	PPH
Benzene	11.14	6.65	8.40	25.06	10.61	17.23
1,3 Butadiene	7.55	5.06	6.07	51.89	30.94	35.68
Ethyl Benzene	1.70	0.48	0.91	6.15	1.73	4.23
2-Butanone	3.78	0.74	1.81	19.62	2.66	13.49
Hexane	3.56	2.03	2.62	14.71	6.90	10.11
Styrene	2.06	1.19	1.53	5.96	4.18	4.10
Toluene	5.59	2.46	3.61	13.29	3.40	9.14
Xylene	7.66	3.18	4.82	22.60	7.78	15.54
*1,1,1-Trichloroethane	2.18	2.84	2.70	11.43	4.03	7.86
*Acrylonitrile	1.04	0.29	0.56	5.45	1.52	3.75
*Methylene Chloride	0.24	0.36	0.33	1.26	1.89	0.87
*Trichloroethene	7.82	1.16	3.49	38.28	3.79	26.32

* These four compounds, 1,1,1-Trichloroethane, acrylonitrile, methylene chloride, and trichloroethene were only identified during some of the GC tests, not during the GC/MS testing. SSAJV believes these compounds were misidentified on the GC, the GC/MS is more accurate in identifying compounds. See text for more details.

Average , maximum and AQD #80 emission rates calculated as explained after Table 3-3.

SSAJV has completed one round of tests for HAPs utilizing the GC/MS on the mine exhaust. Therefore, average and maximum emission rates are assumed to be the same. These emission rates are depicted in Table 3-5.

Table 3-5: Mine Vent Exhaust HAP Emissions

Compound	PPH	TPY
Benzene	0.29	1.29
2-Butanone	0.77	3.39
Hexane	0.43	1.87
Styrene	0.08	0.35
Toluene	2.51	10.98
Xylene	8.67	37.96

not

not

A table of the CAS Numbers associated with the HAP compounds can be found in the Table of Contents Section.

3.1.2 Basis of Source Emissions Estimates

Several new stationary emission sources will be constructed as part of the soda ash expansion project. These sources include: a natural gas fired calciner, natural gas fired dryer, crusher and screening equipment, product sizing and transfer equipment, silos, and a natural gas fired industrial boiler. Emission rates are either vendor guaranteed, estimated from factors in EPA AP-42 Table 1.4-1, October 1986 version, or estimated from stack testing of existing sources. A table summarizing the applicable emission factors, design information, hourly emission rates, and basis of emission estimates for each new source is presented in Table 3-6.

Table 3-6: Basis of Emission Rates for Expansion Sources

Emission Point	Pollutant	Emission Rate	Design Information	Emission PPH	Basis of Estimate
AQD #74	PM ₁₀	0.01 gr/dscf	4,000 dscfm	0.34	Vendor guarantee
AQD #75	PM ₁₀	0.01 gr/dscf	4,000 dscfm	0.34	Vendor guarantee
AQD #76	PM ₁₀	0.01 gr/dscf	43,150 dscfm	3.70	Vendor guarantee
AQD #77	PM ₁₀	0.01 gr/dscf	2,600 dscfm	0.22	Vendor guarantee
AQD #78	PM ₁₀	0.01 gr/dscf	3,200 dscfm	0.27	Vendor guarantee
AQD #79	PM ₁₀	0.01 gr/dscf	2,400 dscfm	0.21	Vendor guarantee
AQD #80	PM ₁₀	0.015 gr/dscf	92,750 dscfm	11.93	Vendor guarantee
	NO _x	0.05 lb/MM Btu	400 MM Btu/hr	20.00	Vendor guarantee
	CO	3.81 PPT	275 tons _{ore} /hr	1048	Testing
	VOC	1.94 PPT	275 tons _{ore} /hr	534	Testing
AQD #81	PM ₁₀	0.01 gr/dscf	20,250 dscfm	1.74	Vendor guarantee
AQD #82	PM ₁₀	0.01 gr/dscf	47,555 dscfm	4.08	Vendor guarantee
	NO _x	0.15 lb/MM Btu	200 MM Btu/hr	30.00	Vendor guarantee
	CO	0.07 lb/MM Btu	200 MM Btu/hr	14.00	Vendor guarantee
	VOC	1.4 lb/MMft ³ _{gas}	193,237 ft ³ _{gas} /hr	0.27	AP-42 Table 1.4-1
AQD #83	PM ₁₀	0.01 gr/dscf	3,350 dscfm	0.29	Vendor guarantee
AQD #84	PM ₁₀	0.01gr/dscf	6,900 dscfm	0.59	Vendor guarantee
AQD #85	PM ₁₀	5 lb/MMft ³ _{gas}	96,618 ft ³ _{gas} /hr	0.48	AP-42 Table 1.4-1
	NO _x	0.038 lb/MM Btu	100 MM Btu/hr	3.80	Vendor guarantee
	CO	0.09 lb/MM Btu	100 MM Btu/hr	9.00	Vendor guarantee
	VOC	2.8 lb/MMft ³ _{gas}	96,618 ft ³ _{gas} /hr	0.28	AP-42 Table 1.4-1
	SO ₂	0.6 lb/MMft ³ _{gas}	96,618 ft ³ _{gas} /hr	0.06	AP-42 Table 1.4-1

Equipment downstream of the three existing calciners (AQD #s 17 and 48) will be replaced to provide additional production throughput. The basis for the expected emission rates following the modification are noted in the table below:

Table 3-7: Basis of Emission Rates for Modified Sources

Emission Point	Pollutant	Emission Rate	Design Information	Emission PPH	Basis of Estimate
AQD #17	PM ₁₀	0.022 gr/dscf	120,424 dscfm	22.30	Testing/Estimate
	NO _x	0.05 lb/MM Btu	500 MM Btu/hr	25.00	Testing/Estimate
	CO	3.81 PPT	400 tons _{ore} /hr	1524	Testing
	VOC	1.94 PPT	400 tons _{ore} /hr	776	Testing
AQD #48	PM ₁₀	0.018 gr/dscf	60,212 dscfm	9.34	Testing/Estimate
	NO _x	0.05 lb/MM Btu	250 MM Btu/hr	12.50	Testing/Estimate
	CO	3.81 PPT	200 tons _{ore} /hr	762	Testing
	VOC	1.94 PPT	200 tons _{ore} /hr	388	Testing

The existing baghouse (AQD #³⁶~~66~~), will be eliminated by combining the pick-up points with an existing baghouse (AQD #⁴⁶~~53~~), which has excess capacity. The proposed fourth crusher line will have particulate emissions controlled by an existing baghouse, AQD #47. This baghouse was originally designed for this additional crusher. Furthermore, allowable PM₁₀ emission rates on a number of existing baghouses and the existing boilers will be reduced to more closely reflect actual emissions. Discussion of these changes are detailed in Section 3.1.2.2 - Modification to Existing Sources.

3.1.2.1 New Sources

AQD #74 - North Headframe

Upon reaching the production shaft headframe, trona ore will be conveyed to the primary screen distribution bins. Further details can be found on the process flow diagram 000-PF-131 (see Dust Collection Points Numbers 1, 2, and 3). The particulate emissions will be controlled by the North Headframe Baghouse, with an air to cloth ratio of 4:1. This baghouse will meet an emission limit of 0.01 grains/dscf, resulting in a rate of 0.3 PPH

PM₁₀. Testing of existing ore handling sources reveals no detectable VOC or HAP emissions; therefore, it is assumed this source will not emit VOCs or HAPs.

AQD #75 - Primary Crushing

Dust generated in the primary crushing area will be controlled by the Primary Crushing Baghouse, with an air to cloth ratio of 4:1. Further details can be found on the process flow diagram 000-PF-131 (see Dust Collection Point Numbers 4, 5, and 6). An emission limit of 0.01 grains/dscf will be met, resulting in 0.03 PPH of PM₁₀. As noted above, no VOC or HAP emissions are expected.

AQD #76 - Primary Screening

Particulate emissions resulting from the transport of trona ore via belts from the primary screening area will be controlled by the Primary Screening Baghouse. Further details can be found on the process flow diagram 000-PF-131 (see Dust Collection Point Numbers 7 through 25). The baghouse will have a 4:1 air to cloth ratio. The emission limit will be 0.01 grains/dscf, resulting in a rate of 3.7 PPH of PM₁₀. As noted above, no VOC or HAP emissions are expected.

AQD #77 - Transfer 101

Dust generated from the conveying of the primary screen undersize material will be controlled by Transfer Baghouse 101. Further details can be found on the process flow diagrams 000-PF-131 and 000-PF-132A (see Dust Collection Point Numbers 26 and 27). The air to cloth ratio of the baghouse will be 4:1. The emissions will be controlled to a limit of 0.01 grains/dscf, resulting in a rate of 0.2 PPH of PM₁₀. No VOC or HAP emissions are expected.

AQD #78 - Transfer 102

The particulate emissions generated from the conveying of trona ore from the west reclaim will be controlled by Transfer Baghouse 102. Further details can be found on the process flow diagram 000-PF-131 (see Dust Collection Point Numbers 28 and 29).

The air to cloth ratio will be 4:1, meeting an emission limit of 0.01 grains/dscf, resulting in a rate of 0.3 PPH of PM₁₀. No VOC or HAP emissions are expected.

AQD #79 - Transfer Point

Dust generated on the west reclaim transfer conveyor will be controlled by a dust collector meeting an emission limit of 0.01 grains/dscf, resulting in a rate of 0.2 PPH of PM₁₀. Further details can be found on the process flow diagram 000-PF-132A (see Dust Collection Point Numbers 30 and 31). No VOC or HAP emissions are expected.

AQD #80 - Calciner #4

The natural gas fired calciner will convert raw trona ore to a crude soda ash through the calcination process in which CO₂ and H₂O are evolved. Particulate emissions will be controlled by an Electrostatic Precipitator (ESP) to a limit of 0.015 gr/dscf. The unit is designed at 92,751 dry standard cubic feet per minute (dscfm), resulting in an emission rate of 11.93 PPH or 52.25 TPY of PM₁₀. A low NO_x burner will be installed, resulting in emission rates of 0.05 lb NO_x/MM Btu and 0.07 lb CO/MM Btu. This 400 MM Btu/hr burner will emit 20 PPH of NO_x (87.6 TPY) and 28 PPH of CO (122.64 TPY).

Testing of the existing calciners has revealed CO, VOC, and HAP emissions due to the calcination of the trona ore. Due to the extreme variability and the limited number of samples, a very conservative approach to determine maximum emission rates of these pollutants was utilized. For CO and HAPs a statistical analysis of stack test results was done to derive the expected average and maximum hourly emission. First, the average result is calculated, then to it is added 3 times the standard deviation. Statistically, this result depicts the maximum hourly emission rate with a confidence level of 99.7 percent. Utilizing this statistical method, maximum CO emissions are estimated at 3.81 PPT as noted in Table 3-8.

Table 3-8: AQD #80 CO Emissions

**Stack Test Results and
Statistical Analysis
(Pounds per Ton of Ore)**

AQD #	17	48
Date	Oct-95	Apr-95
Run #1	3.066	0.618
Run #2	2.313	0.508
Run #3	2.470	0.455
Average	2.62	0.53
Std Dev	0.40	0.08
Ave + 3(SD)	3.81	0.78

With a maximum hourly production rate of 275 TPH, a maximum of 1,047.75 PPH, or 4,589 TPY of CO emissions are expected.

Estimated average HAP emission rates are summarized in Tables 3-2, 3-3, and 3-4.

Concerning VOC emissions, the highest stack test result was used as the maximum emission factor of 1.94 PPT, the average of the stack test results was used as the average emission factor of 0.766 PPT as noted in the table below:

Table 3-9: AQD #80 VOC Emissions

**Stack Test Results and Statistical Analysis
(Pounds per Ton of Ore)**

Date Tested	AQD #17	AQD #48	Both
Jan-95	-	0.528	
Apr-95	-	0.349	
Oct-95	0.676 ✓	0.329	
Dec-95	0.458	0.520	
Jul-96	0.578 <i>Site '96</i>	1.94	
Nov-96	1.483 <i>Site '96</i>		
Average	0.799	0.733	0.766

At a production rate of 275 TPH, the maximum expected hourly emission rate is 533.5 PPH of VOC, the average expected hourly emission rate is 210.7 PPH. Process flow diagram 000-PF-133C reveals the layout of the calciner and ESP.

AQD #81 - Dryer Area

Particulate emissions due to the transfer and conveying of soda ash in the dryer area will be controlled by a baghouse meeting an emission limit of 0.01 gr/dscf, resulting in a rate of 4.08 PPH (17.87 TPY) of PM₁₀ emissions. Further details can be found on the process flow diagram 000-PF-141D (see Dust Collection Point Numbers 33 through 42). The Dryer Area Baghouse will be designed at a 4:1 air to cloth ratio. No other pollutants are expected to be emitted.

AQD #82 - Dryer #6

The natural gas fired dryer will convert the sodium carbonate monohydrate to anhydrous sodium carbonate with the removal of free and molecular moisture. The average production rate will be 137 TPH, with a maximum instantaneous rate of 161 TPH, resulting in an annual soda ash production of 1.2 MM TPY from this unit. Particulate emissions will be controlled by an Electrostatic Precipitator (ESP) to a limit of 0.010 gr/dscf. The unit is designed at 47,555 dscfm, resulting in a emission rate of 4.08 PPH or 17.87 TPY of PM₁₀.

A flame grid burner will be installed, resulting in vendor guaranteed emission rates of 0.15 lb NO_x/MM Btu and 0.07 lb CO/MM Btu. This 200 MM Btu/hr burner will emit 30 PPH of NO_x (131.4 TPY) and 14 PPH of CO (61.32 TPY). VOC emissions are estimated per Table 1.4-1 of EPA AP-42 at 1.4 lb/MM ft³_{gas}. At 193,237 ft³_{gas}/hr, the emission rate of VOC is 0.27 PPH (1.18 TPY). HAP emissions are estimated to be below detectable limits. Process flow diagram 000-PF-142B reveals the layout of the dryer and ESP.

Table 3-10: AP-42 Emission Factors for AQD #82

Utility Boilers (> 100 MM Btu/hr)

Pollutant	Factor	PPH	TPY
VOC	1.4 lb/MM ft ³ _{gas}	0.27	1.18

Note: The Btu value of natural gas is 1035 Btu/scf

AQD #83 - Silo Top

Particulate emissions resulting from the conveying of soda ash into the silos will be controlled by a dust collector. These emissions will meet a limit of 0.01 gr/dscf, resulting in a rate of 0.59 PPH of PM₁₀ (2.58 TPY). No other emissions are expected. Further details can be found on the process flow diagram 000-PF-141C (see Dust Collection Point Number 43).

AQD #84 - Silo Bottom

Dust generated from the conveying of soda ash from the silos will be controlled by the Silo Bottom Bag Filter. Further details can be found on the process flow diagram 000-PF-141C (see Dust Collection Point Numbers 44 and 45). An emission limit of 0.01 gr/dscf will be met, resulting in 0.59 PPH of PM₁₀ (2.58 TPY). The baghouse will be designed with a 4:1 air to cloth ratio.

AQD #85 - Industrial Boiler

A natural gas fired industrial boiler will be installed to supply heat for mine ventilation as well as other requirements throughout the facility as needed. The emission factors used for natural gas combustion for an industrial boiler rated between 10 and 100 MM Btu/hr for CO, VOC and SO₂ are noted in Table 3-11. These emission factors are derived from Table 1.4-1 of AP-42, October 1986 version.

Table 3-11: AP-42 Emission Factors for AQD #85

Industrial boilers (10-100) MM Btu/hr

Pollutant	Factor	PPH	TPY
PM ₁₀	5 lb/MM ft ³ _{gas}	0.48	2.10
SO ₂	0.6 lb/MM ft ³ _{gas}	0.06	0.26
VOC	2.8 lb/MM ft ³ _{gas}	0.27	1.18

Note: The Btu value of natural gas is 1035 Btu/scf

The boiler manufacturer estimates NO_x emissions at a rate of 0.038 lb/MM Btu and CO emissions at a rate of 0.09 lb/MM Btu. Therefore, the 100 MM Btu/hr boiler will emit 3.8 PPH of NO_x (16.64 TPY) and 9.0 PPH of CO (39.42 TPY).

Identification of new and existing emission sources is presented in the facility plot plan (AQ-300, Page 1), with a key of the emission source numbers presented on page 2 of AQ-300.

3.1.2.2 Modification to Existing Sources

3.1.2.2.1 AQD #17 - Calciners #1 and #2

AQD #17, is the common stack for the two original calciners. Each calciner is equipped with a low NO_x burner and an ESP. The calciner section will be modified to increase the production rate of each calciner from a maximum of 162.5 TPH to 200 TPH, a total increase for the two of 75 TPH. This will be accomplished by replacing the existing drag conveyors downstream of the calciners with bucket elevators.

Although the burners are rated at 200 MM Btu/hr, it is anticipated that they will perform at 250 MM Btu/hr, while maintaining an emission rate of 0.05 lb NO_x/MM Btu. This will result in an increase of 2.5 PPH for each burner, or 5 PPH NO_x increase (21.9 TPY) for

AQD #17.

The air flow will increase approximately 20 percent from a permitted rate of 100,000 dscfm to 120,424 dscfm. It is anticipated that PM₁₀ emissions will not exceed the existing permit limit of 22.3 PPH. The ESPs on these units were originally designed to control particulate emissions due not only to the trona ore but also from the coal used to fire the calciners. When the units were converted to natural gas firing per MD-229, the particulate emission rate of 22.3 PPH was set from an estimate of 0.026 gr/dscfm. Based on stack testing, it is believed that these units will perform at approximately 0.022 gr/dscf; at 120,424 dscf, AQD #17 will continue to meet the existing 22.3 PPH particulate emission limit. Compliance of the particulate emission limit will be demonstrated utilizing EPA Methods 5 and 202, with the "back half inorganic" portion added to the "front half particulate" for a "total" particulate emission rate.

Although CO, VOC, and HAPs are evolved in small concentrations from the combustion of natural gas, it has been demonstrated that these compounds are also emitted from the trona ore during the calcination process. Emission factors have been derived from actual testing at the SSAJV facility. The maximum emission factor for CO is 3.81 PPT and for VOC is 1.94 PPT. At a production rate increase of 75 TPH, CO and VOC emissions are expected to increase by 286 PPH (1,252 TPY) and 145 PPH (637 TPY) respectively. Details of HAP emission increases are noted in Tables 3-2, 3-3, and 3-4.

3.1.2.2.2 AQD #48 - Calciner #3

As with AQD #17, AQD #48 is equipped with a low NO_x burner and an ESP. This calciner section too will be modified to increase the production rate from 162 TPH to 200 TPH, an increase of 38 TPH.

Although the burner is rated at 200 MM Btu/hr, it is anticipated that it will perform at 250 MM Btu/hr, while maintaining an emission rate of 0.05 lb NO_x/MM Btu. This will result in an increase of 2.5 PPH for the burner, an annual increase of 10.95 TPY of NO_x.

The air flow will increase by approximately 10 percent from a permitted rate of 54,000 dscfm to 60,212 dscfm. It is anticipated that PM₁₀ emissions will not exceed the existing permit limit of 9.34 PPH. The ESP was originally designed to control particulate emissions of a coal fired unit, although it has always fired natural gas. Therefore, there is excess capacity in the ESP. It is believed that the unit will perform at approximately 0.018 gr/dscf; at 60,212 dscfm, AQD #48 will continue to meet the existing 9.34 PPH particulate emission limit. Compliance of the particulate emission limit will be demonstrated utilizing EPA Methods 5 and 202 as described above.

The same CO and VOC emission factors are used for AQD #48 as #17. With an increase in production of 38 TPH, CO and VOC emissions from AQD #48 are expected to increase by 145 PPH (634 TPY) and 74 PPH (323 TPY) respectively. Details of HAP emission increases are noted in Tables 3-2, 3-3, and 3-4.

3.1.2.3 Modification to Existing Particulate Emission Limits

Through recent testing of representative baghouses, it has been determined that a number of existing baghouses are performing at much lower particulate emissions than the permitted allowable rates. It has been determined that AQD #46 (Trona Transfer), has enough capacity to handle the emissions from AQD #2b (Ore Reclaim). Furthermore, through testing of the boiler stacks (AQD #s 18 and 19), it has been discovered that the permitted emission limit is higher than actual. To more closely reflect actual emission rates, SSAJV is requesting these identified sources have the permitted PM₁₀ emission rates adjusted, as noted in Table 3-12. Other information concerning the sources is also listed.

Table 3-12: Modified Existing Particulate Emission Limits

AQD #	Source	Air:Cloth	acfm	dscfm	gr/dscf	PPH	TPY
6b	Silo reclaim	3:1	7500	5900	0.01	0.51	2.22
11	Coal transfer	4:1	3200	2500	0.01	0.21	0.94
14	Boiler coal bunker	5:1	5400	4275	0.01	0.37	1.60
18	Boiler #1	N/A	N/A	N/A	N/A	10.0	43.8
19	Boiler #2	N/A	N/A	N/A	N/A	10.0	43.8
41	Sulfite Loadout	4:1	2510	2250	0.01	0.19	0.84
46	Trona Transfer	3:1	10500	8275	0.01	0.71	3.11
47	Crusher	6:1	43094	33875	0.01	2.90	12.72
50	Dryer Area	6:1	26000	16250	0.01	1.39	6.10
53	Silo Bottom #2	6:1	13175	10500	0.01	0.90	3.94

As noted in CT-946, AQD #47 (Crusher Baghouse), was sized to handle a fourth crusher line. Since the CT-947 project was not constructed, AQD #47 still has the capacity to control particulate from a fourth crusher, which will be installed with this project.

Total annual emissions are calculated by multiplying hourly rates by 8,760 hours. Emission rates of all existing sources with proposed adjusted emission rates and the proposed expansion sources are noted in the Table 3-13.

AQD #	SOURCE	Name	PM ₁₀		NO _x		SO ₂		CO		VOC	
			PPH	TPY	PPH	TPY	PPH	TPY	PPH	TPY	PPH	TPY
2a	BF-1	Ore crusher	1.60	7.01								
2b ^	BF-8	Ore reclaim	0.00	0.00								
6a	BF-31	Top silos	0.30	1.31								
6b ^	BF-33	Silo reclaim	0.51	2.23								
7	BF-32	PLO	1.20	5.26								
10	BF-35	Coal crushing	0.60	2.63								
11 ^	BF-39	Coal transfer	0.21	0.92								
14 ^	BF-36	Boiler coal bunker	0.37	1.62								
15	WS-4&5	DR 1&2	6.80	29.78	1.20	5.26						
16	BF-24	Product classifier	0.90	3.94								
17	EP-1&2	CA 1&2	22.30	97.67	20.00	87.60			1238.25	5423.54	630.50	2761.59
18 ^	EP-3	BO-1	10.00	43.80	245.00	1073.10	70.00	308.60	17.50	76.85	0.50	2.19
19 ^	EP-4	BO-2	10.00	43.80	245.00	1073.10	70.00	308.60	17.50	76.85	0.50	2.19
24	BF-41	Boiler fly ash silo	0.30	1.31								
25	BF-54	AT crush and screen	1.00	4.38								
28	BF-55	AT Dryer	1.10	4.82	0.05	0.22	0.00	0.00	0.07	0.31		
27	BF-56	AT Bagging & Loadout	0.50	2.19								
28	WS-10	Fluid Bed Dryer	2.90	12.70								
30	BF-507	Lime Bin #1	0.20	0.88								
31	BF-508	Lime Bin #2	0.20	0.88								
33	WS-454	Sulfur Burner			1.50	6.57	0.40	1.75				
35	WS-455	Sulfite Dryer	1.40	6.13								
36	BF-503	Sulfite Bin #1	0.10	0.44								
37	BF-504	Sulfite Bin #2	0.10	0.44								
38	BF-505	Sulfite Bin #3	0.10	0.44								
39	BF-506	Sulfite Bin #4	0.10	0.44								
40	BF-502	Sulfite Bagging	0.00	0.00								
41 ^	BF-501	Sulfite Loadout	0.19	0.83								
43		Sulfur Storage Tank										
44	BF-509	Lime Unloading	0.60	3.94								
45	BF-53	AT Transloading	0.20	0.88								
46 ^	BF-62	Trona Transfer	0.71	3.11								
47 ^	BF-75	Exp Crusher	2.90	12.70								
48	EP-5	CA-3	9.34	40.91	10.00	43.80			617.22	2703.42	314.28	1376.55
50 ^	BF-84	Dryer Area	1.39	6.09								
51	EP-6	DR-5	4.80	21.02	18.00	78.84			2.40	10.51		
52	BF-79	Silo Top #2	0.50	2.19								
53 ^	BF-86	Silo Bottom #2	0.90	3.94								
54	BF-103	T-200 Silo	0.19	0.83								
55	BF-87	Ore recycle/reclaim	0.40	1.75								
62	BF-100	Carbon Silo	0.13	0.57								
63	BF-101	Perlite Silo	0.17	0.74								
64	BF-601	Sulfite Blending #2	0.15	0.66								
65		Sulfite Blending #1	0.06	0.26								
66	WS-9	Carbon/Perlite Scrubber	0.58	2.54								
67	BF-40	Bottom Ash	0.47	2.06								
68		Bagging Trona Silo	0.36	1.58								
70		Bagging Sulfite Silo	0.27	1.18								
71		Bagging MBS Silo	0.27	1.18								
72		MBS Soda Ash Feed	0.11	0.48								
73		MBS Dryer	1.20	5.26	0.15	0.66	0.77	3.37				
MV		Mine Vent							3.75	16.43	115.00	503.70
Modified Sources *												
17		CA-1&2			5.00	21.90			285.75	1251.59	145.50	637.29
48		CA-3			2.50	10.95			144.78	634.14	73.72	322.89
New Sources												
74		North Headframe	0.34	1.49								
75		Primary Crushing	0.34	1.49								
76		Primary Screening	3.70	16.21								
77		Transfer BH 101	0.22	0.96								
78		Transfer BH 102	0.27	1.18								
79		Transfer Point	0.21	0.92								
80		Calciner #4 ESP	11.93	52.25	20.00	87.60			1047.75	4589.15	533.50	2336.73
81		Product Dryer Area BH	1.74	7.82								
82		Dryer #6 ESP	4.08	17.87	30.00	131.40			14.00	61.32	0.27	1.18
83		Silo Top	0.29	1.27								
84		Silo Bottom	0.59	2.58								
85		Boiler #3	0.48	2.10	3.80	16.64	0.06	0.26	9.00	39.42	0.28	1.23
Total For Existing Sources			88.98	389.73	540.90	2369.14	141.17	618.32	1896.69	8307.50	1080.78	4646.22
New Sources			24.19	106.96	53.80	235.64	0.06	0.26	1070.75	4689.89	534.05	2339.14
Modified Sources *			0.00	0.00	7.50	32.85	0.00	0.00	430.53	1885.72	219.22	960.18
Change			24.19	106.96	61.30	268.49	0.06	0.26	1601.28	6675.61	763.27	3299.32
Grand Total			113.17	496.68	602.20	2637.64	141.23	618.59	3397.67	14883.11	1814.05	7945.54
NOTE: ^ Sources with modified emission limits (to more closely reflect actual emissions).												
Modified Sources*: These emissions are due to the increase in throughput of the existing calciners (AQD #s 17 and 48)												
NOX emissions offset by contemporaneous reduction of actual emissions totalling 596 TPY per MD-229.												

3.2 BACKGROUND SOURCES

Since total emission increases from SSAJV's proposed expansion are "significant" for PM₁₀ and CO, air quality impact analyses must be performed for these two pollutants. As explained in Section 5.1.1, there is no modeling requirement for VOC (ozone). If modeled impacts exceed significant impact levels, a cumulative impact analysis, including background sources, must be performed. Regional man-made sources of pollutant emissions are considered as part of a background emissions inventory.

For CO, the necessity of including specific background sources depends upon whether maximum modeled impacts from SSAJV emission sources exceed modeling significance levels. These CO levels are 2,000 µg/m³ and 500 µg/m³ for one and eight-hour averaging periods, respectively. Modeling of SSAJV's CO emissions do not trigger these levels. Therefore, a cumulative impact analysis is not required and a CO background source inventory is not needed.

A potential background source for PM₁₀ is determined by the contribution to PSD increment consumption, or is viewed by the WDEQ/AQD as being necessary to include in a background emissions inventory. The requirement of including a particular background source is also based on recent air quality modeling analyses submitted in support of a PSD permit application. The maximum predicted ambient PM₁₀ concentrations attributable to SSAJV are below significance levels in the vicinity of each of the four regional facilities; FMC, Tg Soda Ash, General Chemical, and OCI Wyoming. In addition, several years of ambient PM₁₀ sampling data have been collected upwind of the SSAJV facility that can be used as representative background PM₁₀ concentrations.

Therefore, a formal PM₁₀ and CO emissions inventory of the four regional soda ash facilities was not prepared.

3.3 NEW SOURCE PERFORMANCE STANDARD APPLICABILITY

New Source Performance Standards (NSPS) which apply to the proposed SSAJV expansion project include Subpart Dc - Standard for Performance for Small Industrial-Commercial-Institutional Steam Generating Units and Subpart OOO - Standards of Performance for Nonmetallic Mineral Processing Plants. Subpart Dc applies to the new boiler (AQD #85), since construction will commence after June 9, 1989 and has a maximum design heat input capacity of 100 MM Btu/hr. Subpart OOO applies to the proposed baghouses, (AQD #s 74, 75, 76, 77, 78, 79, 81, 83, and 84), since they are associated either with a crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station in a nonmetallic minerals processing plant.

The proposed boiler (AQD #85), is fueled with natural gas only, therefore, no emission limitations set forth in Subpart Dc apply to this unit.

WAQS&R Section 10 (b)(i) limits NO_x emissions from new natural gas fired fuel burning equipment to 0.20 lb/MM Btu of heat input. The burners on the calciner (AQD #80), dryer (AQD #82), and the boiler (AQD #85) are rated at 0.05, 0.15, and 0.038 lb NO_x/MM Btu, respectively. At these NO_x emission rates, these proposed units comply with the Section 10 limitation.

The proposed baghouses must meet the Subpart OOO particulate emission limitation of 0.05 g/dscm (0.02 gr/dscf) and 7 percent opacity limit. The new baghouse sources will be designed at 0.01 gr/dscf, half of the Subpart OOO NSPS emission limit, and will meet the 7 percent opacity limitation.

3.4 ASSESSMENT OF BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

Emissions of particulate matter (PM₁₀), carbon monoxide (CO), and volatile organic compounds (VOCs) are the only criteria pollutants which exceed PSD significant emission rates. The NO_x emission increase for this project is offset by a contemporaneous decrease associated with MD-229, therefore, NO_x emissions do not trigger PSD permitting requirements. The WDEQ/AQD requires a BACT demonstration of all criteria pollutant emissions from the new and modified emission sources. This analysis will address BACT for control of PM₁₀, NO_x, CO, VOC, and other criteria pollutant emissions. The sources to be considered in the BACT analysis include all the new sources associated with the 1.2 MM TPY soda ash expansion (AQD #s 74-85). In addition, emissions of CO and VOCs from the mine ventilation exhaust shaft will be considered in the BACT analysis. (The existing mine ventilation shaft will be converted to a production shaft, upon completion of the new ventilation exhaust shaft.) The existing sources at this facility have been subjected to a BACT evaluation in previous permit applications.

EPA policy requires that BACT determinations use a "Top-Down" approach. This approach views the BACT determination on a case-by-case examination of the lowest emission rate that is technically feasible and economically reasonable for each source, and for each pollutant subject to BACT analysis. The first step in this process is to determine the most stringent commercially demonstrated emission rate. The energy, environmental, economic and technological factors are considered relative to the use of this technology/emission rate for this application. This information can be used to justify the selection of a less stringent emission rate for this specific application. The identification of a "technically viable control alternative" considers the following:

- existing control technology used by the industry
- technically feasible alternatives (technology transfer)
- innovative control technology (commercially demonstrated)

- production processes that are inherently less polluting

Documentation of viable control alternatives and demonstrated emission limits can be found in sources such as the BACT/LAER Clearinghouse and support documents submitted for PSD permit applications for similar operations to state and federal regulatory agencies. If the most stringent emission rate is selected, no further BACT analysis is necessary.

Consistent with the intent of the Top-Down approach, a description of available mitigation measures and equipment to be applied to each new or modified emission source, is provided in the following by pollutant type (i.e., PM₁₀, NO_x, CO, VOC, and other pollutants). Comparisons to previous BACT determinations for similar emission source types, is used to support the emission rate selected as BACT.

3.4.1 Particulate Matter

The new and modified point sources of particulate include:

- AQD # 74 - North Headframe
- AQD #75 - Primary Crusher
- AQD #76 - Primary Screening
- AQD # 77 - Transfer 101
- AQD # 78 - Transfer 102
- AQD #79 - Transfer Point
- AQD #80 - Calciner #4
- AQD #81 - Dryer Area
- AQD #82 - Dryer #6
- AQD # 83 - Silo Top
- AQD #84 - Silo Bottom
- AQD #85 - Industrial Boiler

For the emissions associated with the material handling systems AQD #s 74-79, 81, 83, and 84, a fabric filter baghouse or similar control device has been determined to be viable. This technology has been routinely applied to material handling systems, and is widely accepted as resulting in the lowest achievable emission rate (LAER). All particulate emissions from these new sources will be designed to achieve the emission limit for particulate of 0.01 gr/dscf. This control technology is considered to be equivalent to the most stringent control technology available. Consistent with the "Top Down" analysis, if LAER is selected, no alternative technology, and no alternative emission rates need to be evaluated. Therefore, the pollution controls chosen for the new dry product handling and conveying systems meet the BACT requirement. Furthermore, this emission rate of 0.01 gr/dscf is well below the Subpart OOO NSPS of 0.02 gr/dscf.

There are several options that have been considered for control of particulate emissions from AQD #s 80 and 82, the natural gas fired calciner and dryer. Although several options have been considered, the technology selection focused on an electrostatic precipitator (ESP) based on previous industry experience. Although other technologies have been tried in the trona industry for control of particulate from calciners and dryers, the ESP has proven to be the most cost effective. Design of an ESP and the resultant emission rate is dependent on several factors, including the material to be collected, the temperature of the exhaust stream, and the grain loading entering the ESP. The parameters associated with the calciner and the dryer for the trona industry provide a unique set of parameters to the ESP manufacturers. The specific particulate testing requirements of the State of Wyoming include the filterable particulate and the condensible inorganic material collected in the "back-half" of the sampling train (EPA Method 5/202).

Particulate emissions from AQD #85, the industrial boiler, are inherently low due to natural gas firing, and so no further control is needed.

Some particulate emissions also result from fugitive sources. Fugitive sources are generally controlled using passive measures including wetting agents or using covers to

reduce the potential for entrainment. This facility is a leader in the trona industry in emission control and the control of fugitive dust, and this expansion will be consistent with the design and operation of the existing plant. All conveyors and material handling operations will be covered or enclosed to minimize fugitive particulate emissions. Ore storage will be enclosed in a covered building. This type of control is considered BACT.

The SSAJV Tailings Pond is permitted through WDEQ-Land Quality Division, Permit #495, for 225 surface acres. As the water level in the pond fluctuates, the exposed dry beaches may lead to fugitive dust emissions if not treated. SSAJV has developed a program to control the emissions by spraying a mixture of flocculant and water on the dry areas. This forms a thin crust that has proven to be very successful in controlling fugitive emissions from the Tailings Pond area.

3.4.1.1 AQD # 74 - North Headframe

The ore handling operations at the headframe will result in some particulate emissions. These particulate emissions will be controlled by a fabric filter baghouse sized to handle 5,000 acfm, and emissions at the exit of the fabric filter will be designed to meet the emission limit of 0.01 gr/dscf. This technology and emission rate are widely recognized as BACT.

3.4.1.2 AQD #75 - Primary Crushing

The facility expansion will include the introduction of a new mining process referred to as "long wall" mining. This mining technique is expected to result in a larger run-of-mine ore. A primary crusher will be built to accept the mined ore and reduce it to minus 3" size. This source will be controlled by a fabric filter designed to handle a flow of 5,000 acfm and achieve the emission limit of 0.01 gr/dscf. This technology and emission rate are BACT.

The existing ore crusher facility was originally built and permitted per MD-132 with a large baghouse dust collection system capable of effectively treating particulate

emissions from the fourth crusher. This baghouse dust collection system controls particulate to meet the emissions limitation of 0.01 gr/dscf. Since it was originally designed to handle this additional volume of ore, this is not considered a modification to this source (AQD #47) The technology and emission rate applied to this source are BACT.

3.4.1.3 AQD #76 - Primary Screening

Particulate emissions generated from a new screening facility will be vented through a baghouse dust collection system. This fabric filter will be sized to handle a flow rate of 54,000 acfm. The emissions will be designed to meet the limit of 0.01 gr/dscf at the exit. This technology and emission rate are BACT.

3.4.1.4 AQD # 77 - Transfer 101

Particulate emissions from the conveyor transfer point transporting trona ore from the primary screen will be controlled by venting through a new baghouse sized to handle 3,250 acfm. The emissions will be controlled to meet an outlet emissions limitation of 0.01 gr/dscf. This technology and emission rate are BACT.

3.4.1.5 AQD #78 - Transfer 102

Particulate emissions generated by this transfer point on the west reclaim conveyor will be controlled by a new 4,000 acfm baghouse designed to meet the emission limitation at the outlet of 0.01 gr/dscf. This technology and emission rate are BACT.

3.4.1.6 AQD #79 - Transfer Point

Particulate emissions generated by the west reclaim transfer conveyor will be controlled by a 3,000 acfm dust collector and meet the outlet emission limitation of 0.01 gr/dscf. This technology and emission rate are BACT.

3.4.1.7 AQD #80 - Calciner #4

Particulate emissions generated from the new calciner will be controlled by an electrostatic precipitator (ESP), similar to the control technology employed on the existing calciners. The most recent BACT determination for particulate control from a calciner, indicated a BACT emission limit of 0.017 gr/dscf. For this project, ESP vendors were requested to design an ESP with an even lower emission rate if possible. Vendors have guaranteed an increase in the control efficiency to achieve 0.015 gr/dscf. This control efficiency is better than the BACT for previously permitted trona calciners. Thus, the use of an ESP on the new trona ore calciner to meet the emission limit of 0.015 gr/dscf is considered equivalent to the most stringent control available, BACT.

3.4.1.8 AQD #81 - Dryer Area

Particulate emissions from the area surrounding the new product dryer will be controlled by venting through a baghouse designed to handle 35,000 acfm throughput. The fabric filter will be designed to meet the emission limitation at the outlet of 0.01 gr/dscf. This technology and emission rate are BACT.

3.4.1.9 AQD #82 - Dryer #6

To handle the additional soda ash production, a new natural gas fired product dryer will be installed, equipped with an electrostatic precipitator (ESP), similar to the control technology employed on the existing dryer (AQD #51). The most recent BACT determination for particulate control from a dryer, indicated a BACT emission limit of 0.017 gr/dscf. For this project, ESP vendors were requested to provide an ESP with an even lower emission rate. Vendors have guaranteed an improvement in the control efficiency to achieve 0.010 gr/dscf for this source. This control efficiency is better than the BACT for previously permitted soda ash dryers. Thus, the use of an ESP on the new product dryer to meet the emission limit of 0.010 gr/dscf is considered equivalent to the

most stringent control available.

3.4.1.10 AQD #83 - Silo Top

Particulate emissions generated from the transfer of soda ash into the product silo will be controlled by a baghouse dust collection system sized to handle 5,300 acfm. Controlled particulate emissions will be designed to meet an outlet emissions limitation of 0.01 gr/dscf. This technology and emission rate are BACT.

3.4.1.11 AQD #84 - Silo Bottom

Particulate emissions generated from the transfer of soda ash out of the silos will be controlled by a dust collector. It will be designed to handle 11,000 acfm of air, with resultant particulate emissions meeting the outlet emissions limitation of 0.01 gr/dscf. This technology and emission rate are BACT.

3.4.1.12 AQD #85 - Industrial Boiler

A 100 MM Btu/hr natural gas fired boiler will be installed to provide heat for the mine ventilation system and other areas of the facility as needed. Particulate emissions resulting from the gas combustion are predicted to be 0.48 PPH. Combustion of natural gas results in inherently low particulate emissions, and no additional controls have been applied to control particulate emissions at similar facilities. A brief review of the literature did not identify particulate control that is commercially viable for this type of installation and, therefore, no additional control is proposed.

3.4.2 Nitrogen Oxides (NO_x)

The new and modified sources of Nitrogen Oxide (NO_x) emissions are:

- AQD #80 - Calciner #4
- AQD #82 - Dryer #6
- AQD #85 - Industrial Boiler
- AQD #17 - Calciner #s 1 & 2
- AQD #48 - Calciner #3

These sources are each fueled with natural gas. The primary means of controlling NO_x from natural gas combustion is use of an efficient burner design. In some situations where LAER is required, NO_x removal can be achieved using post combustion controls including Selective Catalytic Reduction (SCR) and Selective non-Catalytic reduction (SNCR). Post combustion control is not considered viable for this installation as explained below:

The SCR process uses ammonia in the presence of catalysts to convert nitrogen oxides into the basic elements of nitrogen and oxygen. This technology is relatively expensive, requires flue gas temperature of 500 to 800 degrees F, uses heavy metals for the catalysts, ammonia for the reagent, and often produces hazardous wastes. Ammonia is considered an extremely hazardous air pollutant, and can contribute to safety concerns at the facility. In the United States, this technology has been applied to combustion turbines, and diesel engines. Internationally there has been some application of this technology to coal-fired power plants.

The SNCR process requires a much higher flue gas temperature (1600 - 1800 degrees F) to reduce the NO_x. This process has been demonstrated on combined cycle natural gas fired projects using ammonia for the reagent. Urea has also been proposed as a reagent, but operation has not been demonstrated on a similar scale.

SCR and SNCR are not considered applicable for installation in the trona industry due to many unresolved design issues. A primary concern is that the introduction of ammonia or urea will affect the quality of the product. Other concerns involve disruption of the process at the temperature zone appropriate for injection of the reagent. The process is recognized to have an emission of ammonia which "slips" through the process unreacted. There is a potential for the environmental harm caused through the manufacture and disposal of the catalyst material and the emission of ammonia during the process, to be greater than the environmental benefit gained through the additional NO_x control. Since this technology has not been applied to the trona industry in the past, there is no indication that the technology is superior to the control offered by low NO_x burners. There is no commercial demonstration of post combustion control

technology in the trona industry, it is not considered applicable to the exhaust streams of either the calciner or the dryer.

3.4.2.1 AQD #80 - Calciner #4

North American Manufacturing Company (NAMCO) offers a Magna Flame LEX low NO_x burner for applications like the calciner that utilize a refractory lined combustion chamber. Based on experience working with NAMCO, and the burners currently installed on the existing calciners, SSAJV has determined that the emission limit of 0.05 lb NO_x/MM Btu is achievable for this application. This is consistent with the recent BACT determination for the calciner burners approved for installation on the existing calciners and is recognized as the lowest achievable emission rate for this source.

3.4.2.2 AQD #82 - Dryer #6

There is a significant difference in the technology for burner design associated with the product dryer compared to the other sources. A significant concern in dryer design is avoiding potential contamination of the final product. The low NO_x burners on the market generally use a design that incorporates a refractory around the burner. The refractory has the potential to degrade and erode over time. This is acceptable in the calciner because the product is processed and refined following the calcination process, but insoluble material is not acceptable in the product dryer. In the dryer, refractory could add contaminants to the final product, therefore a burner design with refractory is unacceptable for application in the dryer.

The design and service requirements of the product dryer in the trona industry are unique to that industry. Because of the unique requirements, review of such resources as the EPA RACT/BACT/LAER Information Clearinghouse (RBLIC) do not provide additional information regarding technology that is applicable to this emission source. NAMCO is one of the leading burner manufacturers which provides options for low NO_x burner design applicable to sources in the trona industry. NAMCO commercially offers only one design option that does not have refractory and may therefore be suitable for installation in a product dryer. This NAMCO "Flame Grid" burner system is currently in

operation on SSAJV's existing natural gas fired dryer (AQD #51). NAMCO has guaranteed a NO_x emission rate for the proposed dryer of 0.15 lb/MM Btu. NAMCO is currently bench testing a 0.05 lb NO_x/MM Btu "Magna Flame Lex Burner" with a high alloy (Inconel) liner rather than the usual refractory. This design has not been commercially demonstrated. There are substantial concerns regarding the integrity of the liner during extended operation and potential maintenance requirements. Because this design has not been commercially demonstrated, it is not considered available technology and is not evaluated further. Therefore, BACT for a soda ash product dryer is a flame grid burner with an emission rate of 0.15 lb NO_x/MM Btu.

3.4.2.3 AQD #85 - Industrial Boiler

The NSPS (40 CFR 60 Subpart Dc) for boilers of this size and type (natural gas fired, 100 MM Btu/hr) does not establish a limit for NO_x emissions. A review of the RBLIC indicated that post combustion control technology has not been installed on similar simple cycle natural gas fired boilers, and is, therefore, not considered commercially applicable technology for the boiler. Based on this information, the BACT determination has focused on burner design. The RBLIC review indicated that boilers of this type and size have used various combinations of low NO_x burner technology, including staged air combustion, flue gas recirculation, and excess oxygen controls. The lowest emission rates found for similar facilities were located in Kern County California where BACT was established at the emission limit at 0.043 lb/MM Btu for NO_x. This project has been able to obtain a lower expected NO_x emission rate, and is purchasing a package boiler designed to achieve a stack emission limit of 0.038 lb NO_x/MM Btu. This is lower than the most stringent emission limit found in reviewing other similar sources, and is therefore, by definition, considered BACT, and no further analysis is necessary.

3.4.3 Volatile Organic Compounds (VOCs) including Hazardous Air Pollutants (HAPs)

Volatile Organic Compound (VOC) emissions may result from uncombusted fuel (natural gas) or from the organics inherent in the trona ore. Included in the VOCs may be Hazardous Air Pollutants (HAPs), as listed in Section 112(r) of the Clean Air Act Amendments. HAP emissions are a relatively small component of the total VOC emission. The majority of VOC emissions from the calciner stack are assumed to be emitted during the calcination of the trona ore. This process is required to convert the ore into a crude soda ash, before further refinement. Furthermore, it has been determined that small concentrations of VOC may be emitted from the ore during the underground mining of the trona ore. Testing of the mine return air stream has revealed low concentrations of VOCs and HAPs. The mine is ventilated for the safety of the workers per Mine Safety and Health Administration (MSHA) regulations.

VOC and HAP emissions are also predicted to result from the natural gas combustion associated with the product dryer and the package boiler. The following BACT discussion for VOC controls is also relevant to the control of HAPs:

- AQD #80 - Calciner #4
- AQD #82 - Dryer #6
- AQD #85 - Industrial Boiler
- AQD #17 - Calciners #1 & 2
- AQD #48 - Calciner #3
- Mine Exhaust

3.4.3.1 AQD #80 - Calciner #4

The following sections address VOC emissions from calciner operation. The VOC emissions from calciner operations result from small concentrations of organics, inherent in the ore. This situation is unique to the trona industry.

Identification of Technically Feasible VOC Control Options

Combustion and removal are the two principal categories of control methods for VOC emissions. Applicable VOC emissions control technologies considered in identification of technically feasible control options for the calciner are listed below and are described in the following subsections.

- Destruction/Combustion (including flaring, and thermal and catalytic incineration)
- Absorption
- Adsorption
- Condensation

Tables 3-14 and 3-15 summarize cost effectiveness of these control options:

Table 3-14: Cost Effectiveness, AQD #80 VOC Control

COST COMPONENT:	Catalytic Oxidation	Carbon Adsorption	Condensa- tion
DIRECT COSTS:			
<i>Purchased Equipment Costs</i>			
Basic and Auxiliary Costs (Base & 35%)	\$6,376,750	\$7,900,500	\$9,056,250
Structural Support (10% of Basic and Auxiliary Equipment)	637,675	790,050	905,625
Sales Tax (4% of Basic and Auxiliary Equipment costs)	255,070	316,020	362,250
Freight (4% of Basic and Auxiliary Equipment costs)	255,070	316,020	362,250
<i>Subtotal-Purchased Equipment Costs (PEC)</i>	7,524,565	9,322,590	10,686,375
<i>Direct Installation Costs</i>			
Installation/Foundation (25% of PEC)	1,881,141	2,330,648	2,671,594
<i>Subtotal-Direct Installation Costs</i>	1,881,141	2,330,648	2,671,594
TOTAL DIRECT COSTS(TDC)	9,405,706	11,653,238	13,357,969
INDIRECT INSTALLATION COSTS			
Engineering Costs (5% of PEC)	376,228	466,130	534,319
Construction Fees and Field Expenses (15% of TDC)	1,410,856	1,747,986	2,003,695
Contingency (15% of TDC)	1,128,685	1,398,389	1,602,956
OTHER INDIRECT COSTS			
Start-up and Performance Tests (1% of TDC)	94,057	116,532	113,580
TOTAL INDIRECT COSTS	3,009,826	3,729,036	4,274,550
TOTAL CAPITAL INVESTMENT (TCI)	12,415,532	15,382,274	17,632,519
DIRECT ANNUAL COSTS			
Direct Labor (2,000 hr @ 12.50/hr)	25,000	25,000	25,000
Maintenance Labor (1,000 hr @ 15.00/hr)	15,000	15,000	15,000
Replacement Parts (1.5% of Purchased Equipment Costs)	112,968	139,839	160,296
Catalyst Replacement Cost (assumes replacement every 5 years)	995,761	N/A	N/A
Fuel Usage (\$2.05 per Mscf)	5,863,000	N/A	N/A
Electricity (\$0.06/kW*hr)	N/A	489,925	117,300
Steam (\$0.003/lb)	N/A	65,700	N/A
Water (\$1.95/1000 gal)	N/A	512,460	N/A
Waste Disposal (\$2,000/ton)	N/A	N/A	1,680,000
TOTAL ANNUAL DIRECT COSTS	7,011,629	1,247,924	1,997,596
INDIRECT ANNUAL COSTS			
Overhead (60% of labor)	24,000	24,000	24,000
Property Tax (1% of TCI)	124,155	153,823	176,325
Insurance (1% of TCI)	124,155	153,823	176,325
Administration (2% of TCI)	248,311	307,645	352,650
TOTAL INDIRECT ANNUAL COSTS	520,621	639,291	729,301
TOTAL ANNUAL INVESTMENT	7,532,251	1,887,215	2,726,896

CAPITAL RECOVERY FACTOR			
Equipment Life (years) = 10			
Interest Rate (%) = 10			
Capital Recovery Factor	0.16	0.16	0.16
CAPITAL RECOVERY COSTS			
TOTAL CAPITAL REQUIREMENT	12,415,532	15,382,274	17,632,519
TOTAL ANNUAL CAPITAL REQUIREMENT	2,020,571	2,503,394	2,869,611
TOTAL ANNUALIZED COST (Total annual O&M cost and annualized capital cost)	\$9,522,821	\$4,390,609	\$5,596,508
UNCONTROLLED TONS OF VOC EMITTED PER YEAR (BASELINE EMISSIONS)	923	923	923
TONS OF VOC EMITTED AFTER CONTROL	46	46	46
TONS OF VOC REMOVED PER YEAR	877	877	877
COST EFFECTIVENESS			
ENVIRONMENTAL BASIS			
(\$ per ton of VOC removed)	\$10,858	\$5,006	\$6,664

Table 3-15: Cost Effectiveness of Flare

COST BASE DATE	March 1990
VAPCCI	Third Quarter 1995
INPUT PARAMETERS	
Vent flowrate (acfm)	264000
(lb/hr)	417020
Vent heat content (Btu/scf)	0
Fuel heat content (Btu/scf)	1000
Inlet gas temperature (°F)	338
Vent stream density (lb/scf)	0.0845
System pressure (psig)	10.00
Liquid density (lb/ft ³)	50
DESIGN PARAMETERS	
Gas velocity, max (ft/sec)	60.00
Auxil. fuel requirement (scfm)	113105.14
Total gas flowrate (scfm)	377105
Flare tip diameter (in)	154.59
Heat release rate (Btu/hr)	493749
Flare height (ft)	4.0
KO drum max. velocity (ft/sec)	4.84
KO drum min. diameter (in)	408.1
KO drum height (in)	1224.4
KO drum thickness (in)	0
No. of pilot burners	1
CAPITAL COSTS	
<i>Equipment Costs (\$)</i>	
Flare/self-supported	2,231,888
Flare/guy-supported	0
Flare/derrick-supported	0
Minimum flare cost	2,231,888
Knockout drum cost	96,652
Total equipment (base)	2,328,540
Total equipment (escalated)	2,772,379
Purchased Equipment Cost (\$)	3,271,408
Total Capital Investment (\$)	6,281,103

ANNUAL COST INPUTS

Operating factor (hr/yr)	8760
Operating labor rate (\$/hr)	16
Maintenance labor rate (\$/hr)	17.20
Operating labor factor (hr/yr)	630
Maintenance labor factor (hr/sh)	1
Steam price (\$/1000 lb)	5
Natural gas price (\$/Mscf)	3
Annual interest rate (fraction)	0
Control system life (years)	15
Capital recovery factor	0.1098
Taxes, insurance admin. factor	0

ANNUAL COSTS

<u>Item</u>	<u>Cost (\$/yr)</u>
Operating labor	9,853
Supervisory labor	1,478
Maintenance labor	9,419
Maintenance materials	9,419
Natural gas	500,066
Steam	6,794,757
Overhead	18,102
Taxes, insurance, administrative	251,244
<u>Capital recovery</u>	689,631
Total Annual Cost	8,283,970

CONTROL COST EFFECTIVENESS

Pollutant	VOC
Uncontrolled Emissions, lb/hr (average hourly)	210.7
Operating Hours, hr/yr	8760
Uncontrolled Emissions, ton/yr	923
Control Efficiency, %	98
Emissions After control, ton/yr	18.5
Pollutants Removed, ton/yr	904.5
Cost Effectiveness, \$/ton	9,159

NOTE: Data used to develop this spreadsheet were taken from Chapter 7 of the OAQPS Control Cost Manual (4th edition).

VAPCCI = Vatauvuk Air Pollution Control Cost Index (for flares) corresponding to year and quarter shown.

Base equipment cost, purchased equipment cost, and total capital investment have been escalated to this date via the VAPCCI and control equipment vendor data.

3.4.3.1.1 Destruction/Combustion Devices

The process most often used to control the emissions of organic compounds from process industries is incineration (also referred to as oxidation). At sufficiently high temperatures and adequate residence times, any hydrocarbon can be converted to carbon dioxide and water by the combustion process. Destruction/combustion devices are often relatively simple devices capable of achieving very high destruction efficiencies. They consist of burners, which ignite the fuel (an organic) and a chamber, which provides adequate residence time for the oxidation process. Equipment used to abate waste gases by combustion can usually be divided in three categories; flares, thermal incinerators and catalytic incinerators.

3.4.3.1.1.1 Flares

Flaring is a high-temperature oxidation process used to burn combustible components, mostly hydrocarbons, of waste gases from industrial operations. Natural gas, propane, ethylene, propylene, butadiene and butane constitute over 95 percent of the waste gases flared. During a combustion reaction, carbon dioxide (CO₂) and water are formed when gaseous hydrocarbons react with atmospheric oxygen. Several intermediate products are also formed, and eventually, most are converted to CO₂ and water, but some quantities of stable intermediate products such as carbon monoxide (CO), hydrogen, and hydrocarbons will escape as emissions. Flares are used extensively to dispose of (1) purged and wasted products from refineries, (2) unrecoverable gases emerging with oil from oil wells, (3) vented gases from blast furnaces, (4) unused gases from coke ovens, and (5) gaseous wastes from chemical industries. Gases flared from refineries, petroleum production, chemical industries and to some extent, from coke ovens, are composed largely of low molecular weight hydrocarbons with high heating value.

Flaring systems are considered technically feasible control options for the control of VOC. However, due to the large volume of the exhaust stream and extremely low Btu content, supplemental fuel and air would be required to combust the VOCs present in the exhaust stream and a steam-assisted flare would be needed to achieve the desired removal. Costs indicate that this option is not economically feasible.

3.4.3.1.1.2 Thermal Incineration

Thermal incineration is also a high-temperature oxidation process, but unlike flaring, the combustion waste gases pass over or around a burner flame into a residence chamber where combustion is completed. Thermal incinerators, also referred to as thermal oxidizers or afterburners, can be used over a fairly wide, but low, range of organic vapor concentrations. The concentration of the organics in the vapor stream must be substantially below the lower flammable level (lower explosive limit). Combustion in the thermal oxidizers is conducted at elevated temperatures to ensure high chemical reaction rates for the organics. To achieve this temperature, it may be necessary to preheat the feed stream with auxiliary energy.

Thermal recuperative and thermal regenerative are the two main types of thermal incinerators in use. The thermal recuperative type is the most common and nearly always employs a heat exchanger to preheat a gaseous stream prior to incineration. Regenerative type incinerators are newer and employ ceramics to obtain a more complete transfer of heat energy. There are no known applications of thermal recuperative incinerators on calciners, and single catalyst incinerators can achieve the same removal efficiency at potentially lower annual costs; therefore, this option is not evaluated further.

3.4.3.1.1.3 Catalytic Incineration

Catalytic incinerators are very similar to thermal incinerators, except that the combustion within the chamber takes place in the presence of a catalyst. The presence of the

catalyst in the combustion chamber reduces the combustion temperature needed to ensure complete combustion, thus reducing supplemental fuel consumption and associated operating costs. Catalysts used are typically composed of an inert substrate coated with a metal alloy that require extremely clean exhaust streams to operate efficiently. Although catalytic incinerators can achieve overall VOC control efficiencies of 95% for most applications, their capital and operating cost makes them economically infeasible for this application.

3.4.3.1.2 Absorption

Absorption is a removal control method for VOC emissions. The process of absorption refers to the contacting of a mixture of gases with a liquid so that part of the constituents of the gas will dissolve in the liquid. Referred to as scrubbing, gas absorption, as applied to the practice of air pollution, is concerned with the removal of one or more pollutants from a contaminated gas stream by treatment with liquid. The necessary condition is the solubility of these compounds in the liquid.

Absorption can be classified as physical or chemical. Physical absorption occurs when the absorbed compound simply dissolves in the solvent. Chemical absorption occurs when a reaction occurs between the absorbed compound and the liquid. The absorption rate is determined by the physical properties of the gaseous/liquid system (i.e., diffusivity, viscosity, density) and the scrubber operating conditions (i.e., temperature, flow rates of the gaseous and liquid streams). It is enhanced by lower temperatures, greater contacting surface area, higher liquid/gas ratios and higher concentrations in the gas stream. To absorb VOCs, another organic solvent must be used and this solvent must be treated to release the VOCs. Solvent emission would be greater than existing emissions.

While absorption can be considered a "technically feasible" control technology, no known applications of absorption have been applied to calciner operations at trona plants. Therefore, the application of this control method is considered "technically

unreasonable” for this application. Additionally, the cost of developing absorption applications for the process would be prohibitive. Therefore, the scrubbing option has not been further evaluated.

3.4.3.1.3 Carbon Adsorption

In adsorption technology, VOCs are selectively removed and adsorbed on the surface of an adsorbent material. The adsorbed substance does not penetrate the structure of the solid but remains entirely upon the surface. Activated carbon is the most widely used adsorbent, however other substances such as silica gel or alumina can also be used in specialized applications. Adsorbed VOCs are removed from the carbon bed by heating to a sufficiently high temperature (usually via steam) or by reducing the pressure to a sufficiently low value (vacuum desorption).

As with absorption methods, carbon adsorption systems have not been applied to the exhaust of trona calciners. Although carbon adsorption can be considered a “technically feasible” control technology, the application of this control method is considered “technically unreasonable” for this application, and even if feasible, is shown to be cost-prohibitive.

3.4.3.1.4 Condensation

Condensation is a separation technique in which one or more volatile components of a vapor mixture are separated from the remaining vapors through saturation followed by a phase change. The phase change from gas to liquid can be accomplished in two ways; the system pressure may be increased at a given temperature or the system temperature may be reduced at constant pressure. When condensers are used to control emissions, they are usually operated at the pressure of the emission source, which is typically close to atmospheric. Depending upon the temperatures required for condensation, a refrigeration unit may be necessary to supply the coolant.

Surface and contact condensers are the two most common types of condensers. With surface condensers, coolant typically flows through the tubes and the vapor condenses on the outside of the tubes. The condensed vapors form a film on the cool tubes and are drained to a collection tank for storage or disposal. In contact condensers, the vapor mixture is cooled by spraying a cool liquid directly into the gas.

Condensers generally require inlet concentrations of thousands of ppm in order to achieve removal efficiencies of greater than 80 percent. The VOC concentration of the calciner exhaust will be low, so a roto-concentrator type device would have to be used in order to concentrate the stream and make adsorption feasible. As with other technologies described above, there are no applications of condensers to calciners at trona plants. Also a cost estimate indicates that this option is cost prohibitive.

While most of the control options discussed above are considered technically feasible, none are practical and would be too costly to warrant consideration for the purpose of VOC removal from the calciner exhaust stream. Also, there are no calciners with add-on controls listed in the BACT/LAER Clearinghouse. The VOC concentrations present are quite low, given the large volume of the exhaust stream. Since there is so little energy available in the exhaust stream, energy requirements are very high for the conventional combustion-based options that would normally be applied in such a situation. A cost analysis performed for several technically feasible control options indicates that all add-on options are cost prohibitive. Therefore, the proposed BACT for the calciner is no add-on controls and efficient combustion.

3.4.3.2 AQD #82 - Dryer #6

The VOC emissions predicted for the dryer are primarily a result of the incomplete combustion of natural gas. A review of the RBLIC identified that no controls for VOC emissions have been applied to any similar process. A review of the literature has also

not identified any technology that would be appropriate to apply to this installation. Based on this review, combustion controls designed to maintain a stable flame, and VOC emission rates not to exceed $1.4 \text{ lb/MM ft}^3_{\text{gas}}$ is determined to be BACT. This source will meet this emission limit

3.4.3.3 AQD #85 - Industrial Boiler

The natural gas fired boiler is similarly considered a "clean" burning facility. The relatively small amount of VOC emissions are a result of incomplete combustion of the natural gas. No "add-on" controls have been applied to similar facilities. Based on this review, combustion controls designed to maintain a stable flame, and VOC emission rates not to exceed 2.8 lb/MM scf are determined to be BACT. This source will meet this emission limit.

3.4.3.4 AQD #17 - Calciner #s 1 & 2

See discussion of new calciner AQD #80.

3.4.3.5 AQD #48 - Calciner #3

See discussion of new calciner AQD #80.

3.4.3.6 Mine Exhaust

VOC emissions from the ore are released to the atmosphere at the mine ventilation exhaust shaft. A total of approximately 115 PPH of VOC emissions are predicted (504 TPY). This rate is based on testing of the existing mine ventilation air. Results show a VOC emission rate of 0.0113 gr/dscf . The new mine exhaust will have an air flow rate of approximately $1,500,000 \text{ acfm}$ ($1,200,000 \text{ dscfm}$). No feasible method has been identified to reduce the emissions from the mine vent. There are no similar sources identified in the RBLIC, and there are no control technologies considered feasible for application to a source of this size. The flow rate for this source is more than five times larger than the flow rate for the new calciner, and the concentration of VOC emissions is approximately 25 percent of the concentration resulting from the calciner. Since it has been shown to be uneconomical to provide control for the calciner, it is also

uneconomical to control a source, such as the mine ventilation exhaust air, having a lower gas temperature and a lower VOC concentration.

3.4.4 Carbon Monoxide (CO)

Carbon Monoxide (CO) will be emitted from four new or modified sources:

- AQD # 80 - Calciner
- AQD #82 - Dryer
- AQD #85 - Boiler
- AQD #17 - Calciner #s 1 & 2
- AQD #48 - Calciner #3
- Mine Exhaust

CO is a result of incomplete combustion. The installation of low NO_x burners often increases the formation of CO. There are no CO controls that have been applied to any source in the trona industry. In general, CO is an undesirable product in the combustion process, and is a sign of inefficient combustion. Where NO_x control is a primary objective, higher CO emissions are generally an accepted by-product.

The primary control technique for CO has historically been the use of efficient combustion. Where additional control has been required, some type of additional oxidation process has been used to convert the CO to CO₂. Catalysts have been used to reduce CO from automobiles, combustion turbines, and from sources associated with the petrochemical industry. In some cases, boilers or flares have been used to combust relatively high concentrations of CO.

3.4.4.1 AQD #80 - Calciner #4

We have estimated the CO emission based on available source testing information. For the calciner, the estimated value includes CO that is known to form from incomplete combustion of the natural gas fuel and from the hydrocarbons inherent in the trona ore. There is some indication that a significant amount of CO is formed in the calcining process from incomplete combustion of the carbon containing compounds in the ore. Based on source testing information, the emission rate is predicted to be a maximum of

3.81 PPT, or 1,048 PPH.

A review of the RBLIC indicated that no CO controls have been applied to similar sources. There is no information indicating that there is any control technology for CO that would be feasible for installation on this type of source. The recent BACT determination prepared by OCI also indicated that there was no technology considered technically or economically feasible for this application.

3.4.4.2 AQD # 82 - Dryer #6

The dryer is estimated to produce approximately 0.07 lb of CO per MM Btu, or 14 lbs/hr at 200 MM Btu/hr. This emission rate is higher than the emission factor presented in AP-42, Table 1.4-1 of 40 lb/MM ft³_{gas} (7.7 PPH) for natural gas fired boilers greater than 100 MM Btu/hr. The higher CO emission rate is reflective of the burner installed to minimize production of NO_x. A review of RBLIC and the literature did not indicate any CO control technology applicable to this type of process. The only feasible control technology is combustion controls to assure a stable flame and good combustion.

3.4.4.3 AQD #85 - Industrial Boiler

The CO emissions from the 100 MM Btu/hr boiler are estimated based on vendor information. The emissions will meet the limit of 9.0 PPH (0.09 lb/MM Btu). This emission rate is higher than the emission factor of 35 lb/MM ft³_{gas} (3.4 PPH) presented in AP-42, Table 1.4-1 and reflects the increased CO associated with the low NO_x burners selected for this installation. A review of RBLIC and the literature did not indicate any CO control technology applicable to this type of process. The only feasible control technology is combustion controls to assure a stable flame and good combustion.

3.4.4.4 AQD #17 - Calciner #s 1 & 2

See discussion of new calciner AQD #80.

3.4.4.5 AQD #48 - Calciner #3

See discussion of new calciner AQD #80.

3.4.4.6 Mine Exhaust

Some CO is released in the mine ventilation exhaust air. The concentration predicted for the mine vent shaft is an emission rate of 3.75 PPH. The CO is released during the mining process. The flow rate from the mine vent shaft (1,500,000 acfm) is very large resulting in a very low concentration of CO in this exhaust stream. No control has been applied to any source similar in volume flow rate or CO concentration. There is no technology that would be appropriate to apply to the mine vent to reduce the concentration of CO.

3.4.5 Other Pollutants

Due to the natural SO₂ scrubbing ability of trona ore and soda ash, the small amount of SO₂ emissions associated with the combustion of natural gas will be converted to sodium sulfate (Na₂SO₄) in both the new calciner and dryer (AQD #s 80 and 82). Furthermore, due to the small magnitude of SO₂ emissions anticipated from the boiler, further reductions of this pollutant would not be warranted based on environmental and economic considerations.

Ore/Product Conveyor Rates

AQD#	Associated Conveyors	Description	Expected Flowsheet Capacity tph	Corresponding Dust Emission Point
74	1 410-AF-017	North Headframe Apron Feeder	402	*1
	2 410-BC-053	North Headframe Discharge Conveyor	603	*1
	3 410-BC-054	Primary Screen Feed Conveyor	1005	*2
	4 410-BC-055	Screen Feed Bin Distribution Conveyor	1005	*3
75	1 410-BC-063	Primary Screen O/S Transfer Conveyor	201	*4
	2 410-AF-019	Primary Crusher Apron Feeder	201	*5
	3 410-BC-064	Primary Crusher Discharge Conveyor	201	*6
76	1 410-AF-018 A thru D	Primary Screen Apron Feeder	250 each	*7,*8,*9,*10
	2 410-BC-057	Primary Screen O/S Collection Conveyor	201	*11,*12,*13,*14 (50 tph each) & *23
	3 410-BC-059	Primary Screen M/S Collection Conveyor	643	*15,*16,*17,*18 (161 tph each)
	4 410-BC-058	Primary Screen U/S Collection Conveyor	161	*19,*20,*21,*22 (40 tph each) & *24,*25
77	1 410-BC-061	Primary Screen U/S Transfer Conveyor	161	*26,*27
78	1 420-BC-066	West Reclaim Conveyor	643	*28,*29
79	1 420-BC-067	West Reclaim Transfer Conveyor No. 1	643	*30,*31
81	1 550-SN-019 thru 022	Product Screens	40 tph each	*33,*34,*35,*36
	2 610-BC-042	No. 4 Product Belt Conveyor	161	*38,*39,*40,*41 (40 tph each) & *41,*42
	3 610-BC-043	No. 4 Product Transfer Conveyor	161	*41
83	1 610-BC-043	No. 4 Product Transfer Conveyor	161	*43
84	1 610-BC-060	Product Loadout Belt Conveyor	161	*44,*45